A Work Project, presented as part of the requirements for the Award of a Masters Degree in Management from the NOVA – School of Business and Economics.

OPPORTUNITIES AND THREATS FOR THE LAUNCH OF A SMARTPHONE APP

EDUARDO MANUEL ROSAS NOBRE QUINTEIRO LOPES #1614

A Project carried out on the Field Lab Entrepreneurial Innovative Ventures, under the supervision of:

Professor Filipe Castro Soeiro

JANUARY 7TH 2015

OPPORTUNITIES AND THREATS FOR THE LAUNCH OF A SMARTPHONE APP

Abstract

The following work project illustrates the opportunities and threats of the industry for the launch of a smartphone app. In the first part, the technological and economic contextual drivers are analyzed in-depth through the study of key variables for the proliferation of the industry. In the second part, the characteristics of the market are exposed through a market assessment including an analysis of the industry rivalry and industry mapping. The political, legal and ethical concerns emergent from the launch of a new smartphone app are then illustrated with the use of two case studies.

Keywords: smartphone industry, mobile web, app industry.

Table of contents

1. Purpose of the project – General overview

The present research work is the first part of a three-piece work project in collaboration with There App,[1] an innovative mobile live video-streaming platform, in the Field Lab of Entrepreneurial Innovative Ventures.

The purpose of this part of the project is to expose the industry dynamics and industry attractiveness, hence the opportunities and threats in the industry for the launch of a smartphone[2] app[3].

The scope of this research work will be the analysis of the macroeconomic context and variables that influence the smartphone app industry. The methodology is quantitative and focuses on answering to the Overarching Research Question: What are the market opportunities and threats for the launch of a smartphone app? In order to answer this, two Sub-Research Questions are identified. The first one is "What are the contextual driving forces of the industry?" and the research method will be quantitative through the exposition of the data affecting the key variables for the industry. The second one is "What are the market characteristics and trends?" and the research methods include Industry Mapping, Porter's Five Forces Analysis as well as the use of two case studies.

The technological and economic contextual driving forces of the industry are determined by identifying the individual variables of these fields that have an impact on the smartphone industry. An analysis is made on its evolution and visible trends for its future development. They are mainly related with the devices capable of supporting a smartphone app, the inputs required for the functioning of such app and the platforms through which the product is distributed.

In order to identify the market trends, a market assessment is carried out combined with the exposition of the trends visible for the evolution of the categories of smartphone apps available.

To expose the opportunities and threats of the market, two case studies are used, each regarding one of the two main dangers that emerge with the launch of a smartphone app: the data collected by the companies that own the smartphone app and the disruption of industries. Both examples expose apart from economic factors, the political, legal and ethical concerns that arise.

---

[1] Apart from my work on the macroeconomic environment for the launch of a smartphone app, Alexandre Prata (Nova Sbe Msc. Management student 1418) examines the general outline of the business plan and Miguel Farrancha (Msc. Management student 1448) analyses in-depth how There App customer groups' needs affect the design of the platform.

[2] A smartphone is a telephone that runs an operating system.

[3] An app is a downloadable program that fulfills a particular purpose.

2. Literature review

When Steve Jobs said "every once in a while, a revolutionary product comes along that changes everything", he had clearly thought of the impact that mobile devices could deliver upon the World. Many experts see the future of mobile as "the future of online" (Murphy)[4] and even "the future of everything" (Galligan)[5]. Indeed, mobile apps have proven to be an extraordinary tool for innovation and, as Porter states, innovation is the central issue in economic prosperity.

As mobile devices assume a central role in consumer's everyday life (Technological Foresight Ltd., 2006), researchers have tried to evaluate the effectiveness of smartphone apps in fields as varied as medical purposes such as pain assessment (de la Vega, 2014) or oral contraceptive reminding (Gal et al, 2014) to agricultural purposes (Confalonieri et al, 2013) passing through transportation systems (Simonyi et al, 2014), among others. These experts have agreed that while there are still some limitations on the mobile delivery of these services, namely possible loss of quality of the service, mobile and more specifically smartphone apps hold the key for "incremental innovation with a transformational impact" (Pold).[6] [7]

Mobile's importance is not restricted to individuals and should also assume a central position for corporations (Scomavacca et al, 2006). The possibilities and benefits of embracing mobile for corporations is bounded only by their limitations in implementing and delivering appropriate products and services. Good execution, full optimization and adapting to consumer needs are requirements for a successful mobile strategy and non-compliance might prove harmful for corporations (Wilson, 2014)[8]. This harm can come in the form of consumers diverging to competitors if they deem that the mobile experience is of poor quality or if they perceive wrongly the objectives of the mobile app. That is why implementing a mobile strategy is not recommended for everyone and corporations should carefully analyze the benefits of developing an app and resist the temptation to develop one just because it is trendy (Wilson, 2014). Tomi T. Ahonen[9] is widely regarded as one of the leading experts on mobile and even him, who had a strong position against companies developing apps and

---

4 David Murphy is the founder and editor of Mobile Marketing Magazine.

5 Matt Galligan is the CEO and Co-founder of Circa.

6 Incremental innovation is defined as small improvements made by a company over time to a specific product or service that helps maintain or improve their competitive position. Transformational impact means that these improvements produce an effect on the industry and its players changing the existing reality for the product or service.

7 Reijo Pold is the Events & Communications Manager at Telefónica UK.

8 Martin Wilson is the Executive Director of the Mobileweb Company.

9 Tomi T. Ahonen is a Finnish bestselling author and expert on mobile with over twelve books published on the subject. He was named by Forbes magazine the most influential expert in mobile in December 2011. He was also the first to categorize mobile as the seventh mass media channel in his article "Thought Piece", in 2006.

mobile assuming a central role in the strategy of a corporation,[10] now believes that with the increasing importance and penetration of smartphones, companies should prioritize mobile strategy and develop apps, if their market and consumers are indeed most reachable through this channel.

From reduced costs to increased distribution possibilities, mobile technology will deliver new opportunities and mold the business challenges of the future for corporations (Kalakota, 2002). It also eliminates the relevance of the need for economies of scale, namely regarding production, logistics and marketing processes.

3. Technological and economic contextual driving forces

3.1 Smartphone & tablet penetration

The evolution of the smartphone and tablet[11] industry is a crucial input for the growth in the mobile apps industry. Indeed, owning a hand-held mobile device is a requirement to be able to install mobile apps.

This section exposes and analyzes the data in terms of quantity of smartphones and tablets sold globally.

The KPCB report "Internet Trends 2014" reveals that both smartphone and tablet sales have been growing continuously since 2009, in developing and developed regions. This trend is shown by measuring total smartphone and tablet units shipped over this period and also the number of mobile devices relative to the population.

From the first quarter of 2009 until the 4th quarter of 2013, there is an upward trend in quarterly smartphone unit shipments: the number rises steadily from 35 million smartphones shipped in the 1st quarter of 2009 to 315 million shipments in the last quarter of 2013. The trend is only periodically disrupted in the 4th quarter of each year since the Christmas holiday season represents a boost in smartphone sales (APPENDIX 1).

Another interesting evidence is that in the end of 2013, global smartphone users represented roughly 30% of total mobile phone users. This data also has an upward trend: in the end of 2010, this percentage was 10%, rising to around 20% in the end of 2012 and 30% in 2013.

---

[10] Ahonen had this strong position because in the early years of the smartphone app industry, companies regarded having an app as an end by itself and not as a mean to achieve a commercial purpose. Also the industry was not mature and smartphone penetration was not relevant enough to make companies shift their strategic focus towards mobile delivery of services.

[11] A tablet is a mobile computer with a touch screen.

Tablet sales are growing faster than PCs ever did with a 52% growth in 2013. Tablet unit sales for the 4th quarter of 2010 were of 10 million units rising to over 30 million tablets shipped in the last quarter of 2011 and to 60 million in the corresponding period in 2012. The data for 2013 reveals that the value increases to 80 million tablets shipped in the equivalent period (APPENDIX 2).
Tablet sales are even more seasonal than smartphone sales with the number of tablets shipped decreasing largely throughout the year and increasing in the second half of the year to reach a new record in terms of units shipped in the 4th quarter of each year.

Estimates predict that by 2018 the number of mobile-connected devices will reach 1.4 mobile devices per capita: over 10 billion devices for 7.6 billion people (CISCO). From these devices, it is predicted that more than half (54%) will be "smart" devices.

This trend and estimates clearly demonstrate the increasing opportunities for smartphone app developers. The number of devices that will be able to support third-party applications will not stop to rise and, as the target market augments, the diversity of issues and needs that can be resolved or addressed with a smartphone app will also increase, giving birth to new opportunities to serve wider target groups. Overall, this is translated in a growth of market size and market potential.

3.2 Mobile web

This section looks at the trends regarding mobile web usage[12] followed by an analysis of the current state of mobile data packages. This is relevant for this research project since access to mobile web is a requirement for the usage of most smartphone apps and the trends for mobile web usage will have an impact on the market potential.
From here onwards, mobile usage is defined as the aggregated usage of both smartphones and tablets.

3.2.1 Mobile web access

Mobile web access is highly representative of the shift from traditional devices (PCs and laptops) to mobile devices. Indeed, 67% of smartphone users access the Internet everyday through their devices (GOOGLE - OMP).
Comparing data from May 2013 to May 2014, the mobile web usage as percentage of global web usage increased from 14% to 25% globally. This is measured by analyzing the

[12] Mobile web usage is defined as access to the Internet through a mobile device.

percentage of page views that come from a mobile device compared to total number of page views.

Nonetheless, this increase is due to different variations across regions. The discriminated increase is as follows (year-on-year):

- North America: 11 to 19%
- South America: 6 to 17%
- Europe: 8 to 16%
- Asia: 23 to 37%
- Africa: 18 to 38%
- Oceania: 12 to 17%.

It is observable that, in North America, South America, Europe and Oceania, people are still surfing more the Internet through their PCs or laptops. For the more developed regions, this is due to the fact that people own multiple devices and during their work time, they use PCs or laptops to perform their job thus increasing largely the time spent in such electronic devices (GOOGLE – OMP).

In the least developed market, one possible explanation is the price of mobile devices, which is lower than other equipment, making it more accessible for people to purchase such devices. Indeed, households who possess a PC or laptop are not abundant and even in these cases the device is likely to be shared but the household members are likely to possess a smartphone, due to the decreasing cost of smartphones (THE GUARDIAN).[13]

Below are stated some key figures for the current state of Mobile Network as well as trends for the period 2013 – 2018 (CISCO):

- Global mobile data traffic keeps growing at a fast pace and it reached 1.5 exabytes[14] per month in the end of 2013, which represents an 81% increase from the homologous period in 2012. This figure is expected to continue growing at a CAGR of 61% until 2018, reaching 15.9 exabytes per month.

- Mobile video traffic is also assuming a central role surpassing the 50% mark of all mobile data traffic in 2012 and continuing to augment to 53% in the end of 2013. Video's importance and contribution for mobile data traffic is not expected to slowdown and estimates predict that, by 2018, mobile video will account for 69% of mobile data traffic.

---

[13] **Smith, David.** 2014. "Internet use on mobile phones in Africa predicted to increase 20-fold." *The Guardian*, June 5. http://www.theguardian.com/world/2014/jun/05/internet-use-mobile-phones-africa-predicted-increase-20-fold (accessed November 24, 2014).

[14] 1 exabyte corresponds to 1 billion gigabytes.

- Regarding the speed of mobile network connections, this figure more than doubled in 2013 reaching 1,387Kbps (kilobits per second) on average, for downstream speed. It is predicted that mobile network connection speed will double by 2018 exceeding 2.5Mbps (megabytes per second).
- The distribution of usage becomes more spread: in 2010, the top 1% of mobile data subscribers represented around 52% of all mobile data traffic. That figure decreased to roughly 10% in the end of 2013. This trend is expected to further dilute mobile data traffic across users as ownership of mobile devices increases and becomes more accessible and Internet access improves worldwide.

The trends for mobile web access show great promise for the growth of the smartphone app industry. The overall expansion of web services allows developers to search for new opportunities to serve local or global needs. This is due to the increasing diversity and more widespread access to mobile web, opening doors to the creation of new services for a different target but also due to the increasing quality of the service they can provide. This quality is directly affected by the fast-growing connection speeds provided by network companies and also by improvements in the devices that allow developers to implement solutions that might not have been possible without these technological improvements. Once again, this translates into a growing market potential. For companies, these trends mean that developing a mobile strategy for their businesses is becoming crucial and this importance is expected to grow as consumers continue to shift from traditional devices to mobile devices.

3.2.2 Mobile data subscriptions

Depending on the app, its usage might require an Internet connection or not. As such, the availability of mobile data packages emerges as a potential requirement for the functioning of mobile applications.

The state of mobile data subscriptions worldwide (both cellular and broadband) is analyzed below.

The International Telecommunication Union (ITU) report "Facts and Figures 2013" shows that the number of mobile-cellular subscriptions[15] is rapidly approaching the World population figure. It is reported that there were 6.8 billion mobile subscriptions worldwide in 2013 with approximately half of these subscriptions (3.5 billion) corresponding to the Asia-Pacific region. This market saturation translates in decreasing growth rates for mobile-cellular subscriptions both in developed and developing countries.

[15] Mobile-cellular subscriptions represent both postpaid and prepaid subscriptions to a public mobile service, which allows access to public switched telephone networks (WORLD BANK).

Regarding mobile-broadband subscriptions[16], the trend has been a 40% annual growth rate from 2007 to 2013: 268 million to 2.1 billion subscriptions. The price of this service varies greatly across regions and the data from early 2013 (ITU) reveals the following average prices as percentage of monthly Gross National Income per capita:

For postpaid packages of 500MB:

- In developed countries: 1.2%
- In developing countries: 11.3%
- Worldwide: 7.5%

For prepaid packages of 500MB:

- In developed countries: 1.3%
- In developing countries: 15.7%
- Worldwide: 11.4%.

The prices of these services are expected to decrease in the following years. With cheaper access to mobile web, the market size will increase not only because more people will be able to afford these services but also because people will spend more time using their smartphones for web accessing. This aligned with the double-digit growth in mobile-broadband subscriptions visible in the past years and that is not expected to slow down, clearly translates a double factor for more people having longer sessions of web access through smartphones. Market potential increases as developers have a wider range of needs to serve for target groups that will be better served technologically and that will be using more their mobile devices.

3.3 App stores evolution

Mobile apps are distributed through digital platforms called app stores[17] or app marketplaces. These marketplaces allow independent programmers and developers to distribute their third-party applications on a global scale at low rates, which vary from platform to platform.

This section focuses on the example of the Apple App Store to illustrate the functioning and evolution of such marketplaces.

The Apple App Store was launched on July 10, 2008 and it originally had 552 apps available (MACWORLD). Among the initial mobile applications present in the App Store were some

16 Mobile-broadband subscriptions represent wireless Internet subscriptions ranging from modems to mobile phone data packages (2G, 3G and 4G).

17 The term "app store" initially associated with Apple's digital platform has since been coined to describe other marketplaces such as Google Play, Windows Phone Store, Amazon Appstore, amongst others.

that are still widely distributed and used in current days such as Facebook[18], Yelp[19] or Shazam[20]. The price of these apps was commonly $1 or $10 and only 135 of them were distributed for free. The conditions proposed by Apple to the developers were: developers pick the price, 70% of the revenue goes to the developer (Apple keeps the remaining 30%), no credit card fees, no hosting fees, no marketing fees and developers are paid monthly (MACWORLD).

With the appearance of different business models for mobile applications such as subscriptions or in-app purchases[21], Apple extended its 70/30 revenue distribution model to all income coming from mobile apps.

By April 2009, the 1 billion downloads mark was hit and, in September the same year, it reached 2 billion downloads from over 85,000 apps, created by more than 12,500 developers.

In June 2, 2014 at the Apple's Worldwide Developer's Conference in San Francisco, Apple's CEO Tim Cook announced that two impressive numbers were reached: 1.2 million apps available in the App Store (roughly the same as its main competitor: Google Play) and 75 billion downloads. Compared to the data provided at the same conference one year before, this represented a significant increase: 300,000 new apps available and 25 billion new downloads. The increase in the amount paid to developers was also exceptional rising from $10 billion to $13 billion just between the months of June and October 2013.

Tim Cook also announced that user visits to the App Store were in the order of 300 million per week and that the number of registered developers had increased 47% between June 2013 and June 2014 topping 9 million developers (TECHCRUNCH).

These numbers have continued to rise and, in September 2014, Apple reported that 1.3 million apps were available for download on the App Store and statistics from October 2014 indicate that the mark of 85 billion downloads was reached (STATISTA).

The growth in the number of apps available in app stores and the number of developers that create them shows that the competition in the industry is increasing very rapidly. The attractiveness of the market due to its low distribution costs and global reach attracts a lot of new players to the industry and this clearly is a threat for the launch of a new smartphone app. Developers have to aim for differentiation both in scope and quality of their products in order to overcome the increasing competition and, whereas the technological and economic factors

---

18 Facebook is a free online popular social network to connect with other users.

19 Yelp is a free online social network to find local businesses.

20 Shazam is a music identification mobile app that uses the device's microphone to identify songs.

21 Possibility of buying additional content or services within an app.

mentioned up to this point emerged as opportunities, the growth of competition represents a serious threat for the launch of a smartphone app.

3.4 Market share in the smartphone industry

Market share of smartphone manufacturers has an influence on the amount of smartphones that incorporate a certain app store. This will have an impact on the decision of developers to create a product to be delivered in a certain app store and for a certain device. In fact, Apple devices will be granted access to the Apple App Store whereas Android[22] devices will run Google Play.

Samsung emerges as the main players in the smartphone industry with 29% market share worldwide in 2013 (IDC). Apple occupies the second place with 22% market share. The trend is that Android based smartphones will continue to increase in terms of market share due to the diversity of devices that run the operating system compared to the exclusivity of Apple's devices as carriers of the App Store. Huawei, Sony and ZTE possess around 5% market share each. Android phones also are cheaper than iPhones, costing roughly half the price (DIGITAL TRENDS).

The example of the Apple App Store represented in the previous section grants insight to market growth, value and dimension. Nonetheless, other players will also be analyzed below.

Google Play has risen quickly in the past years and has equaled the number of apps present in Apple's App Store: roughly 1.3 million apps in late 2014.

The third largest app store is Windows Phone Store. In the beginning of 2013 it possessed 136,000 apps and by June 2014 this number raised to 300,000 apps (CNET). According to the most recent data, in the Windows and Windows Phone Store combined there are now over 525,000 apps (MICROSOFT). This growth is significant but remains inferior to the growth showed by the two top platforms, mainly due to the reduced market share of Windows phones. The most interesting trend is nonetheless that increasingly app developers are focusing on developing their apps both for iOS[23] and Android. This explains also why Google Play now stands in equal foot with Apple App Store: it is not a case of developers increasingly developing new apps for Android but rather a larger trend of new apps being made available for both platforms. In terms of downloads, Android has already surpassed iOS with 42.6% of total downloads compared to Apple's 39.6%. The Windows Phone Store remains largely insignificant in terms of share of total downloads with 0.3%. These values are for 2013 and are expected to follow the trend of smartphone market share.

---

22 Andoid is an operating system developed by Google for mobile devices.

23 iOS is Apple's operating system for mobile devices.

Regarding the average price of apps, Google Play presents the highest value with $3.66 on average per paid app. iOS paid apps have an average price tag of $1.93 and for Windows Phone, the average value is $1.76. The trend in prices was a sharp decline between 2009 and 2011 but the average has since been slightly increasing and stabilizing.

Due to their larger market share, iOS and Android devices are the most attractive for developers: there is a greater opportunity to pursue these markets when it comes to developing a smartphone app not only because a larger market is available but also because these marketplaces are more mature. There is nonetheless a fundamental difference in the type of crowd developers can reach through one app store or the other: the price of Android devices is lower and therefore the consumer group reachable through Android apps is of lower income and might be less willing to pay for a smartphone application. The fact that Android apps are more expensive on average than iOS apps does not dispute this and paid apps remain a minority in users' smartphones: one quarter of the total number of apps downloaded (GOOGLE / STATISTA). Opportunities arise for developers who seek to create their apps for both operating systems as they roughly double their market size by doing so. The appearance of new players in the smartphone industry might create new opportunities for developers since these new manufacturer's may target a different market (low-income or specific demographic target like people over 65 years old for example) with inherent needs that will need new smartphone apps to deal with their necessities.

4. Market trends and threats

4.1 Market assessment

In this section, research methods such as Porter's Five Forces analysis and Industry Mapping are used to expose the characteristics of the industry. Additionally, Product Life Cycle is examined to determine which app categories present the highest potential for app developers.

4.1.1 Industry mapping

The purpose of this section is to create a map of the smartphone app industry by laying out the existing members in the value chain and the channel through which they are connected to the consumer (APPENDIX 3).

1) **Suppliers**: they represent the companies that provide the services and tools necessary to the creation of the product and efficient value proposition of the smartphone app developer. In general terms, these suppliers will provide the following services: server or web hosting, cloud storage, analytics software, accounting, legal, accounting, anti-fraud and financial.

Some of these services can be bundled such as web hosting and cloud storage or anti-fraud and financial services. Overall there are numerous companies providing these services but some big players such as Amazon or Google (namely for web hosting, analytics and cloud storage) deliver a value proposition more attractive to smartphone app developers due to economies of scale and better and more extensive bundling of services. Indirect suppliers can be companies that create a new service or process that adds value to the chain and is used or replicated by other players.

Company or developer: the entity that develops the smartphone app. Their value proposition must be attractive for customers and their success is highly dependent on two key variables: Viral Coefficient[24] and Viral Cycle Time.[25] Companies must try to reduce the Viral Cycle Time as much as possible and increase the Viral Coefficient through delivering good services and products and investing in marketing and digital marketing actions that will increase the reach of their product or service.

3) **Channel**: the distribution channels for smartphone apps to reach customers are app stores.[26] Channels can also refer to the channels through which information flows between suppliers and companies and are therefore related with online and offline channels of communication.

4) **Customers:** the mobile device owner that is able to download the app. They hold the key for the success of the company. They will choose among the existing offer the product or service that best suits their needs or the product that they perceive as the most popular.[27]

5) **Influencers:** they represent the people or entities that have an influence in the act of customers purchasing or downloading the smartphone app. They might be celebrities, early adopters,[28] notable institutions or companies (Bloomberg for example in the case of investing apps), online and offline magazines and newspapers (TechCrunch[29] or The Wall Street Journal) or friends that refer products or services to the customer.

6) **Competitors:** companies or developers that offer a product that responds to the same need or a similar value proposition.[30]

---

[24] The viral coefficient is obtained by calculating the number of new customers that existing customers are able to convert. If this coefficient is superior to 1 then it is possible to have viral growth.

[25] The Viral Cycle Time is the amount of time required for the following cycle to be concluded: customer discovers the app, customer tries the app, customer likes the app and invites friends, friend receives invitation, friend tries app.

[26] App stores have already been discussed in detail in section 3.3 and therefore the analysis will not be taken deeper in this section.

[27] Influencers determine popularity. Popularity is also determined by the position apps occupy in app stores which is based on the ratings that users give to the app.

[28] An early adopter is a person who embraces an innovation or new product before the majority of people.

[29] TechCrunch is a leading News website that specializes in tech, Internet and startup content.

[30] Competition is examined in detail with the analysis of Porter's Five Forces.

4.1.2 Porter's Five Forces

The analysis of Porter's Five Forces gives insight on the nature and intensity of the rivalry in the smartphone app industry.

Threat of new entrants: the barriers to enter in the industry are relatively low compared to traditional industries. In fact, investment costs are low since a developer can create an app himself incurring only in costs associated with servers, storage and acquiring an official license to release the app on the app store.[31] Legal barriers are easily overcome, as most apps do not file for patents due to the difficulty to protect smartphone apps' code.[32] The global reach and low distribution costs are common to all industry players. Branding may function as a high barrier since customer loyalty can be high especially for social network apps. For other app categories nonetheless, the consumer will choose the app that delivers the best service and access to information is easy with app ratings widely available in the app stores and constant promotion of new apps through the media. Access to suppliers (servers and storage) and to distributors (app stores) does not represent a barrier to entry, even though economies of scale are achievable with the increasing output in terms of data obtained by a smartphone app.[33] Overall, the threat of new entrants is very high as there is a usage of common technology, easiness of access to distribution channels and no need for high capacity or output.

Bargaining power of suppliers: the bargaining power of suppliers (servers and storage) has been reduced over the last years with the introduction of new players who can deliver the same products as the large players. The "inputs" are not scarce with cloud storage space increasing drastically over the last years mainly due to increased competition in providing it.[34] The bargaining power of suppliers remains nevertheless relatively high, especially when dealing with new smartphone app developers,[35] as the number of suppliers that deliver good value propositions is still low.

Bargaining power of customers: Customer bargaining power is relatively high in the smartphone app industry. The high number of customers decreases this bargaining power but, except for some cases in which the app offers an exclusive value proposition (mainly social networks or capital-intensive smartphone apps), customers have a lot of substitute products. Their cost of switching is only attached to the price of the app they want to switch to (free

---

31 A license for developers in the Apple App Store costs $99 per year.

32 Code can be rewritten and reorganized to deliver the same result thus weakening the legal protection available for a smartphone app. Additionally, most apps use code from other interfaces (APIs – Application Programming Interfaces) in order to deliver the service and it makes it even harder to register intellectual property as intellectual property of others is legally used within the code of the app.

33 Web hosting and storage becomes cheaper per data unit as more data is produced.

34 Large companies as well as startups build data centers in order to provide cloud storage to companies. It is therefore not a matter of scarcity in goods but about building more storage space.

35 The data they produce is not sufficient to achieve economies of scale.

most in most cases) unless it is a social network in which case the value is attached to the number of friends who are in the platform.

Threat of substitute products: this threat is high as most apps have substitute apps that serve the same need. Popularity and presence of friends (for social networks) are the key determinants for the success of an app and if there is a substitute product that offers the same value proposition and becomes extremely popular, customers will not have problems in switching, once again mainly due to the low switching costs.

Intensity of competitive rivalry: in theory the rivalry is low in several aspects such as no exit barriers, which facilitates the exit of unprofitable apps even though the costs associated with apps are not high, brand loyalty is mostly dependent on popularity, which removes the sense of loyalty, and the market size is constantly increasing. Nonetheless, product differentiation is complicated as barriers to entry are very reduced and without the existence of severe legal barriers, similar products can easily be created. The rivalry in the industry is highly dependent on the app category but not in traditional terms in which high rivalry leads to possible price wars and extensive investment in promotion. Whereas categories like social networks and capital-intensive apps (investment apps) enjoy a low-competition status for the established players, most of the other categories (games, productivity…) face intensive rivalry.

Overall the rivalry within the smartphone app industry is high but once again highly dependent on the app category. For app developers there is a threat that the need addressed can be easily dealt with by a similar app due to low barriers to entry and the huge and increasing amount of products in the market. There is nonetheless an opportunity for apps that offer a strong value proposition and are able to establish their position in the market before others. Once an app achieves critical mass,[36] its popularity status and customer base is often sufficient for it to enjoy a longer life cycle even though it is also dependent on its constant improvement, in order to maintain competitive advantage over existing and new players.

4.1.3 Product Life Cycle

The life cycle of a smartphone app varies greatly depending on the category, the size it reaches in terms of users and also the operating system. Whereas it is very hard to extrapolate the longevity of an app in absolute numbers, as every app has its own specificities, we can examine the pattern for median half-life of apps, which consists in the time point at which an app reaches its higher number of users.

[36] Inspired in the theory of social dynamics, "critical mass" refers to the number of adopters required for an innovation to become self-sustaining and present further growth.

In a study released by Flurry Analytics,[37] apps in the news category are listed as the ones with longer time cycle to achieve maximum number of users reaching this number after 7 months of release. Health-related and business and communication apps appear in second place with a median half-life of 6 months. This is related to the fact that these apps are constantly renewed with content or provide a service to users that requires tracking of users' activities in order to produce results. This leads to these apps having a longer life cycle. On the lower end appear games, which reach the highest number of users after only 2 months in average. This is due to the low lifecycle of such apps in users devices since after completion, the user will delete them from the smartphone and their visibility in the app store ranking is boosted by their initial popularity. Social apps also have low median half-life: 3 months. This can be explained by the fact that, once again, initial popularity determines the success the application is going to have. Therefore, a social app that does not achieve a high number of users in the first months is not likely to grow exponentially its user base, except for some notable exceptions such as Snapchat.[38]

The peak of monthly active user (MAU) for apps that reach more than 10,000 active monthly users takes place 5 months after its release whereas for the ones that do not reach this number, the peak of MAUs is achieved after 3 months. The logical explanation is that an app that achieves a large user base will continue to grow it for a certain period (2 months) until achieving the peak of MAUs.

Regarding the influence that the operating system has in an app's median half-life, mobile applications developed for iOS enjoy an extra month of growth (4 months), compared to Android apps (3 months), when it comes to reaching its highest number of MAUs. Despite the difference appearing to be low, it represents a time period of growth superior in 33.3%, which is significant and means that developers creating iOS apps will, on average, take a longer period to reach its maximum MAUs, which may or may not be superior to the one for Android apps.

What can be extracted from this data is that app category is a crucial input for a smartphone app lifetime cycle. The category will have an impact on the time the app will take to reach its maximum MAU but also reflects the duration the user will have it on its mobile device. Developers seeking to create long lasting apps should therefore concentrate on developing apps in the news, health or business and communication category. This data also shows that

[37] Flurry Analytics is an analytics company, acquired by Yahoo, which provides their service to mobile developers.

[38] Snapchat is a photo and video sharing mobile app. It only started to increase rapidly its user base after it became popular in high schools more than two months after its release.

apps that surpass a certain threshold in terms of MAUs will enjoy a longer longevity. This also applies to developers seeking to develop iOS apps (APPENDIX 4).

4.2 Usage per app category

By analyzing the usage per app category, it is possible to determine which app categories represent the biggest opportunity for developers to pursue if they want users to interact the most with their app.

In April 2013, roughly five years after the launch of the iPhone and the App Store, Flurry Analytics launched a report[39] which tried to determine how smartphone users where spending their time while using their devices and the app presence in such devices.

The first observable distinction was the usage of smartphones for web browsing and for app usage. Regarding time spent on their devices, web browsing represented 20% of the overall time spent compared to 80% devoted to apps. This section does not seek to go deeper into which web browser users accessed to but rather focus on the app categories that consume the most time.

One impressive figure is the time devoted to the Facebook app by smartphone users: 18% of the total time spent on smartphones is spent on Facebook, which is almost the same as the entire web-browsing share. This is also due to the fact that the Facebook app allows users to browse the Internet (following links posted by friends or pages) without actually leaving the app or opening an external web browser. Taking into account that U.S. smartphone owners use their devices on average 2 hours and 38 minutes per day, Facebook represents over 28 minutes per day in every user's day life. Social networking clearly emerges as a major element of users attention-focus and an additional 6% is revealed when other social networking platforms are added to the account pilling up to 24% of total time spent.

Social network apps are nonetheless not the biggest time consumers since gaming apps take the crown with 32% of "time" share.

Tied in the third place emerge entertainment and utility apps with 8% each (APPENDIX 5).

The second axis measured by the study is the amount of apps opened each day by smartphone users. This number has not changed greatly in the last years: 7.2 in the end of 2010 rising to 7.9 in the end of 2013. This slight increase is representative of the fact that many apps have a short life span such as books or small games and are therefore replaced when they are no longer useful or wished and also the fact that there are only a handful of apps that smartphone users use everyday namely social networking, video or photo sharing and messaging or e-mail apps. It is not correct to assume nonetheless that this worldwide average means that all

[39] This report measured the input from over 300,000 apps, which integrate their analytics service, from over 1 billion smart devices running iOS or Android.

smartphone users possess and use the same apps but rather that, overall, there is an observable trend regarding the number of apps opened each day by consumers.

Data from a different study (GOOGLE / STATISTA), with 1000 participants from each country with available data, reveals that in average a smartphone user has 26.2 apps installed in its device. From these 26.2 apps, 5.6 are paid apps opposed to 20.6 free apps. This varies greatly across countries with South Korea topping the list with over 40 apps installed, of which only 2.7 are paid. The region studied has a large impact in the trend for paid versus non-paid apps (APPENDIX 6).

Using data from 23 countries from 2011 to 2013, there is an upward trend regarding the number of apps installed in smartphones (APPENDIX 7).

Social networking and games emerge as the most time-consuming app categories and are therefore the ones that present greater opportunities for developers to create a product or service with which the users will spend considerable amounts of time. As seen in the previous section though, games are also the category that will have shorter longevity or at least reach its peak in a shorter duration meaning that users will spend a lot of time using a game app but they will delete it when they complete all the content that is offered.

The growing trend in the number of apps per mobile device shows that there is an increasing opportunity for developers to find a way into users' devices, as they will continue to augment the number of slots they provide for apps. Regarding paid versus non-paid apps, it is a regional matter but overall non-paid apps will continue to be perceived as the most attractive for users and therefore presenting a larger opportunity for developers.

4.3 Opportunities and threats to the industry: a look at Snapchat and Uber[40]

This section focuses on two case studies that present some of the political, ethical and legal factors that may arise when developing a smartphone app.

They concern the regulations and legal issues that affect the functioning of the company that develops the smartphone app as well as the variables in the political context that might influence the availability of the app in the country's app store.

While submitting an app to be available on an app store, developers have to first comply with the regulations of the app store itself. Indeed, "approval teams" consisting of both developers and legal experts analyze each submission (APPLE). Being approved does not mean that legal responsibility is shifted to the company owning the app store and several threats emerge for app developers as their product is approved onto the app store.

4.3.1 The danger of data

[40] Uber is a marketplace for car rides.

Smartphone apps collect all types of information depending on its purpose. This information can be personal information (name, address, date of birth…) namely if the app requires or provides the possibility of logging in with a social network account such as Facebook or Google +[41], but it can also be related with banking information if a payment is required for the functioning of the app. In both cases, the company releasing the app is responsible for the treatment of information and is greatly exposed to fraud and theft of information. One example of theft and release of information occurred in September and October 2014 when hackers released over 100,000 pictures exchanged through the Snapchat app, commonly referred to as "snaps", including naked content of underage users (iDIGITALTIMES). This clearly constitutes a breach of security and lack of capability of the Snapchat team to protect the content that is generated within their platform. This becomes especially critical when roughly half the users of Snapchat are between 13 and 17 years old (ENTREPRENEUR).

Snapchat's information collection rules and usage are exposed below. They'll be used as example of how industry players access and process user information.

i) Information gathering

According to their website, Snapchat collects information directly provided by users as well as information automatically collected with the usage of the app. The first set of information includes a unique username, a password, an e-mail address, phone number, list of contacts in the phone and the user's age or date of birth. For additional services, bank account information is also required. The data automatically collected refers to:

- **Usage information**: consists of the information that derives from the app usage and message exchange such as time, date, sender and recipients, number of messages sent and received, friends with higher interaction and also dollar value of Snapcash[42] interactions.
- **Content information**: refers to the content of the messages that is exchanged among users namely the pictures, videos and chats. This information is collected and saved in Snapchat's servers only to be deleted later but not before remaining an undefined time period in the servers and being accessible by third parties which can be Government institutions (with the indirect permission granted by users while accepting the Terms & Conditions) or third party apps to which the user has granted access.
- **Device information**: all types of information are collected about the user's device when he/she accepts the Terms & Conditions. This information includes type of phone, hardware

41 Google + is a Google-owned social network.

42 Snapcash allows users to make money transfers between them using the Snapchat app.

model, operating system and version, device identifiers,[43] browser type, language, phone number, mobile network information as well as other types of information that Snapchat's team might find fit to extract in order to correct crashes and "improve" functionalities ranging from the list of apps present in the device to device performance data.

- **Phonebook and gallery**: for quick integration of necessary data to the app, Snapchat asks for permission to access the device's phonebook and photo and video gallery. The user can revoke the right to access this information.
- **Location information**: especially with the new feature of including geofilters[44] in snaps, users provide the access to their location to the Snapchat team. In other words, it provides the possibility of being tracked by the app servers and the user can also revoke this information even if it will limit the features accessible within the app.
- **Information collected by tracking technologies**: Snapchat deploys cookies, web beacons alongside other technologies to gather and store information about the usage of the app such as number of visits or areas of the app with greater interaction.
- **Website usage information**: a user visiting Snapchat's website will provide Snapchat with access to the following information ,without any other formal consent other than typing their URL address and pressing enter: web browser, language, access times, IP address, pages viewed and previously visited websites.

Additionally, Snapchat also gathers information about users through other sources. These sources can be other users: if a person is present in another user's phonebook, it is sufficient for information to be gathered about him/her. Other companies are also allowed to access the information provided and can inclusively use tracking technologies themselves within the app. These companies will generally gather this information for analytics (Flurry) or advertising purposes and behavioral advertising is one of the main reasons for Snapchat to provide this access to information. Snapchat openly states that currently, "do-not-track" signals sent from the user's device are ignored and do not have any effect for the usage of Snapchat.

ii) Storage and processing of the information

All information is processed in the Unites States, where Snapchat is based. This means that regardless of the location where the content or data is generated, it will flow to the U.S. and users consent this transfer of information. Other countries might also be involved in the

[43] Device specific identifiers include IMEI and MAC address.

[44] Geofilters consist of visual elements added superficially to the original snaps including information about the location of the user.

processing of the information and Snapchat warns its users that despite generating the content in another country, the applicable legislation refers to the countries where the information is processed. In other words, a user from a country in which the Government does not have the legal right to access the information generated in the app might still see its content provided by Snapchat to the Government and law enforcement in the U.S. or other countries through which the information flows. This highlights an important issue regarding the applicable jurisdiction for law enforcement in the smartphone app industry: the local entities of the country in which the user uses the app are not the only ones with legal claims over the content in case of investigations: every country involved in the information flow, such as the content recipient's country and the country in which the company owning the app is based, has legal claim (if local legislation applies) to the information.

The situations in which Snapchat will provide information about the user are defined as follows: in case of legal process or information request if any applicable law, rule or regulation requires so; in case there is a potential violation of user agreements and policies; or if Snapchat undergoes a process of merger, sale of assets, financing or partial or full acquisition of the company.

iii) Sharing the information

Snapchat shares information about users not only for legal reasons but also for other purposes. The information can be shared with other users and in this case it includes personal data (username, number of snaps sent and received, friends with whom users have most interactions, phonebook list), device information (in case of video sharing, information about the sending device is sent to the recipient's device in order to allow the connection) or usage information (other users can see when a snap is viewed or a screenshot – still image of the device's screen – is taken). Information can also be shared with service providers (providing services for Snapchat) or business partners, for advertising or analytics purposes. This means that Snapchat not only allows third parties to collect information within the app but also provides information to them directly. Another type of shared information is the so-called de-identified information, which allows for the creation of Big Data.

An interesting and possibly ethical issue is that by accessing third-party generated content within the app the user acknowledges and agrees that Snapchat is not responsible for how those third-parties collect and use the information.

Snapchat's example illustrates several legal and ethical issues that arise in the smartphone app industry. Users accept the Terms & Conditions frequently without knowing what they are authorizing and, regardless of the fact that it is their responsibility to be informed, several loops are found in such contracts and companies developing apps take advantage of them to

better explore the commercial possibilities of their services. Other ethical concerns may also arise since apps often require access to specific device functions such as camera, speaker, microphone, gallery, and location, among others. This access granted by users virtually provides companies with the possibility of tracking their movements and extract as much information as they want. In other words, app companies are given a tool to "spy" on its users and users provide this right to companies willingly.

There is nonetheless an opportunity to be seized for companies that are transparent towards the data they collect, as this data is highly valuable for advertising and commercial entities. These entities will be willing to pay for this information and it can be key to monetize and generate profits for the company that develops the smartphone app.[45]

4.3.2 Disrupting industries

Companies creating smartphone apps and integrating them as a central part of their business model have a lot of advantages when compared to traditional "brick-and-mortar" companies. From distribution possibilities to reduced operating costs, passing through centralized information gathering, nearly every axis of a business can be optimized if mobile distribution is implemented. This leads to the fact that several industries are being disrupted and, consequently, big industry players are running out of business. As such, and given the fact that these players are powerful influencers, legislation changes are being sought to protect their interests. The example of Uber is used to demonstrate how smartphone apps are disrupting industries and how the "old" players of the industry are trying to fight back. This example will also help illustrate how legislation varies across regions and how innovation may find barriers in existing legislation that does not yet apply to specific cases.

Uber Technology Inc. is a San Francisco based company created in 2009 that uses its app to provide its users with a P2P platform to request or offer transportation. Uber is disrupting the transportation industry and taxi companies are one of the main players affected. With powerful lobbyists, the taxi industry is trying to block the expansion of the service and Uber faces several legal problems worldwide.

These legal charges come from the 3 continents[46] in which Uber has been launched and are generally related with unfair competition and non-compliance with applicable transportation laws. Nonetheless, there seems to be certain inappropriateness on the way governments worldwide are dealing with the introduction of Uber in their national markets. In India for example, Uber was banned after a rape allegedly occurred in the beginning of December

[45] Alexandre Prata (Nova Sbe Msc. Management student 1418) will discuss monetization in detail in the second part of this work project.

[46] North America, Europe and Asia.

(BBC)[47]. Safety should be (and is) a priority for Uber when allowing drivers to register on their platform and the current model attests that drivers comply with the requirements but it can not prevent a driver from committing a crime the same way a taxi company cannot assure that their driver will not commit the same crime. Currently Uber offers two possibilities for users to register as drivers[48]. A background check is also required but the reality is that this system allows for other people to use the car and provide Uber rides without having registered themselves as drivers. Uber has tried to fix this by providing a picture of the registered driver as well as model and plate number of the vehicle but this solution might not be enough. The truth is that Uber does compete unfairly with the "old" industry players as it can provide a service that disrupts the traditional markets. As such it needs to be outstanding on the service it provides and drivers selection because any problem or complaint might lead to major consequences. A lot of people are waiting for these problems to arise and use them as scapegoat to fully eliminate the service.

In the U.S., Uber has received lawsuits and charges in several cities such as Portland, Los Angeles or Philadelphia. In the latter, 45 taxi companies have filled a suit in federal court claiming that the company operates in unfair competition. The lawsuit, filled in December 2013, also targets 18 individuals, among which are Uber drivers accused of operating illegally. In the origin of the complaints is the decreasing value of taxi medallions,[49] which are valued at around $520,000 each, as well as decreasing operations for registered taxi drivers. The Pennsylvania state's Public Utility Commission granted Uber an experimental license to arrange private rides, the month before. This license does not cover the Philadelphia area nonetheless (WSJ).[50]

The granting of the special license shows that local entities are aware of the necessity for innovation in the transportation field and might serve as an example for Governments on how to deal with the pressure imposed by the taxi industry while keeping in mind that reaching optimal output for the consumer should be the priority.

---

[47] **BBC.** 2014. "Uber Delhi 'rape': India tells states to ban web taxis". http://www.bbc.com/news/world-asia-india-30390691 (accessed December 12, 2014).

[48] The first method is to become a UberX driver: drivers must be at least 23 years old, own a car in perfect conditions (subjective element but read as "untouched" physically and in perfect working conditions) with insurance and have a driver's license. The second method aims to offer a more exclusive service with drivers required to be professional drivers meaning that they must have a license and insurance for commercial purposes and own a black sedan or SUV. This service is called UberBlack. In both cases the vehicle has to be not older than 2004.

[49] A taxi medallion is a license to operate as a taxi driver.

[50] **The Wall Street Journal.** 2014. "Philadelphia Taxi Firms File Suit Against Uber". December 24. http://www.wsj.com/articles/philadelphia-taxi-firms-file-suit-against-uber-1419469791/ (accessed December 27, 2014).

Charges against Uber are sprawling everywhere the service is provided and the company faces charges in the Netherlands, Germany, France, Spain, Brazil, Thailand and Taiwan. The most recent charges could even lead to the imprisonment of Uber's CEO Travis Kalanick as he is accused by the South Korean government of infringing local laws on transportation. Specifically, South Korea has a law that prevents car-renting operators to transport passengers for commercial purposes. The punishment goes up to two years in prison alongside heavy fines (CNN).[51] These charges are different because they directly target people within the company instead of the company as a legal entity. Companies that have invested in Uber are also trying to be made accountable legally for the problems arising such as Google Ventures, which invested $258 million in the company.

Uber's example demonstrates the high potential for presenting innovative solutions through smartphone applications. Indeed, there are great opportunities to disrupt existing market and innovative thinking through mobile delivery may be the way to present an optimal solution for consumers while generating large profits for the company developing the application.

The example of Uber also makes it adequate to analyze until where does the legal responsibility go when it comes to suing a company or filling lawsuits. Should Uber's CEO or Google be found guilty, it might be a door too dangerous to open.

5. Conclusion

The analysis of quantitative data and trends complemented with other research methods allows this research project to expose the industry dynamics and industry attractiveness, hence the opportunities and threats for the launch of a smartphone app.

The first opportunity presented arises from the increasing penetration of mobile devices in developed and developing countries. This means, on one hand, that the number of devices that can support smartphone apps – reachable market – is increasing and, on the other hand, the diversity of regions with increased penetration gives birth to the necessity of new solutions and possibilities in the development of smartphone apps to meet specific regional needs (money transfers with reduced bank intervention, for example) as well as emerging global needs (namely for communication and financial services, among others).

This increase in penetration is mainly due to decreasing costs of smartphones, increase in population and improvement in the infrastructure crucial to the use of smartphone apps. Increasing population combined with increasing penetration and lower prices of devices

---

[51] **Wallace, Gregory.** 2014. "Uber CEO charged with operating illegal taxi service in South Korea". CNN, December 24. http://money.cnn.com/2014/12/24/technology/uber-south-korea/ (accessed December 27, 2014).

exponentially augments the reachable market for the upcoming years. Regarding the infrastructure, network providers are offering higher quality services, accessible in more territories and at decreasing costs. This reflects in higher mobile-web connectivity that is necessary for the use of many smartphone apps. There is therefore an alignment between having a larger, more diverse market and this market been better served, which is doubly beneficial for smartphone app developers.

A threat also is imminent from this trend and has been illustrated with the app stores evolution: with the increasing attractiveness of the industry, competition will rise as it is an industry with very low barriers to entry, regardless of the fact that establishing a strong position in the industry proves to be more complicated. This means that there will be more developers, developing more apps per developer, distributing them across more app stores to an increasingly diverse consumer group.

Another exploitable opportunity is the increasing importance of video: smartphone developers should explore the increasing traffic generated by video.

Innovation in smartphone will lead to new capabilities in devices in the following years and new apps will take advantage of these capabilities to deliver services in an innovative way. New usages of smartphone specifications might also arise. This emerges as a way to battle the previously mentioned threat of competition.

Time spent on devices is also increasing and functions as an opportunity for developers to better serve consumers as most of this time is spent using apps. New ways of using apps for daily activities should also be a field to explore. Major opportunities emerge for developers of social network and games apps, as these categories will continue to take the largest share of time spent on devices. Additionally, users are expected to increase on average the number of apps present in their smartphone apps.

The threats to newcomers arise from several sources.

The first threat takes regard to the information collected by companies. Smartphone apps collect a lot of information about their users and the devices they use. This information is highly subject to theft and fraud and is sometimes shared in ways questionable ethically. To fight this, companies developing smartphone apps should improve the treatment and processing of the data, be more transparent as to what information they collect and with whom they share it and also implement anti-fraud measures and better secure the information overall.

The second threat emerges with the disruption of an industry. Industry Life Cycle becomes a relevant issue when examples like Uber demonstrate that it is possible to almost render obsolete an industry with the creation of a smartphone app. One issue that arises is the quality of the service delivered that may be perceived as superior to the consumer but might not

present the same standards as the previously offered service. Also, legislation must be updated to deal with the challenges imposed and created by the "new" industry. This process of creating a legal framework will be lengthy and regulatory measures will surely emerge converging in a certain way the new service towards the old one.

Old industry players will be willing to do everything in their power to prevent their loss of profits and with powerful lobbyist and legal resources, they can try to block innovations and "cut the legs" to newcomers. This means that smartphone app developers have to be extremely careful not to breach legislation and reduce punctual misuses of the apps since legislation might not be formulated to address specific issue deriving from the app usage and terms and powerful economic agents will be waiting for an opportunity to block their growth. Apps will continue to disrupt industries and, while legislation should always be respected, it should also ensure that it is adapted to innovative methods since not being able to do so represents a lost opportunity for improving the social outcome.

The example of Uber also illustrates another great threat to newcomers. These old industry players', which see startups stealing their market share and offering services much less regulated, might use their influence to cause legal organisms to reconsider the extent at which legal responsibility can be attributed. In other words, how far does the legal barrier go to protect developers, investors and workers from being held personally accountable for something created through a legal entity?

Mobile applications hold the key to the future of online services and virtual products as mobile devices increasingly become omnipresent in consumers' lives. Threats will emerge for agents creating innovative solutions in mobile but the opportunities will continue to grow as the market expands both in size and potential.

6. Limitations and next steps

The limitations of this research work derive from the wide scope of the research. This has an influence on the variables measured; the industry players and the competitive environment because, depending on the app category, relevant variables and players are different. This limitation is nonetheless willful since the purpose of this research work is to expose the macroeconomic context for the launch of a smartphone app and not specifically for There App. In fact, this paper is the first part of a three-piece work project in collaboration with There App and the scope of research will be further narrowed in the following two parts of the work project.

7. References

Apple. 2014. Apple Inc. http://www.apple.com/about/ (accessed November 14, 2014).

Cisco. 2014. "Global Mobile Data Traffic Forecast Update, 2013-2018". http://www.cisco.com/c/en/us/solutions/collateral/service-provider/visual-networking-index-vni/white_paper_c11-520862.html (accessed November 1, 2014).

Confalonieri, R., M. Foi, R. Casa, S. Aquaro, E. Tona, M. Peterle, A. Boldini, G. De Carli, A. Ferrari, G. Finotto, T. Guarneri, V. Manzoni, E. Movedi, A. Nisoli, L. Paleari, I. Radici, M. Suardi, D. Veronesi, S. Bregaglio, G. Cappelli, M.E. Chiodini, *et al.* 2013. "Development of an app for estimating leaf area index using a smartphone. Trueness and precision determination and comparison with other indirect methods." *Computers and Electronics in Agriculture*, 96: 67-74.

De la Vega, Rocío, Roman Roset, Elena Castarlenas, Elisaabet Sánchez-Rodriguez, Ester Solé, and Jordi Miró. 2014. "Development and Testing of Painometer: A Smartphone App to Assess Pain Intensity." *The Journal of Pain*, 15(10): 1001-1007.

Fell, Jason. 2014. "From Snapchat to Whisper: Blindly Trusting Companies With Your Privacy Is Stupid". *Entrepreneur*, October 17. http://www.entrepreneur.com/article/238671.

Friedman, Lex. 2013. "The App Store turns five: A look back and forward". *Macworld*, July 8. http://www.macworld.com/article/2043841/the-app-store-turns-five-a-look-back-and-forward.html.

Gal, Noga, Nikki B. Zite, Lorraine S. Wallace. Forthcoming. "Evaluation of Smartphone Oral Contraceptive Reminder Applications." *Research in Social and Administrative Pharmacy*.

Google. 2013. **"**Our Mobile Planet". http://think.withgoogle.com/mobileplanet/en/ (accessed November 24, 2014).

Harbison, Cammy. 2014. " 'The Snappening': 4Chan Hackers Leak More Than 100,000 Snapchat Photos Including Underage Nudes". *iDigitalTimes*, November 10. http://www.idigitaltimes.com/snappening-4chan-hackers-leak-more-100000-snapchat-photos-including-underage-nudes-389270/.

International Telecommunication Union (ITU). 2013. "ICT Facts and Figures 2013". http://www.itu.int/en/ITU-D/Statistics/Documents/facts/ICTFactsFigures2013-e.pdf (accessed November 6, 2014).

Kalakota, R. 2001. *M-Business: The Race to Mobility*, Hershey, PA, USA: Idea Group Publishing.

Khalaf, Simon. 2013. "Flurry Five-Year Report: It's an App World. The Web Just Lives in It". *Flurry*, April 3. http://www.flurry.com/bid/95723/Flurry-Five-Year-Report-It-s-an-App-World-The-Web-Just-Lives-in-It.

Meeker, Mary. 2014. "Internet Trends 2014". Paper presented at the Code Conference 2014, Rancho Palos Verdes, California. KPCB report.

Microsoft. 2014. "Microsoft by the numbers". http://news.microsoft.com/bythenumbers/index.html (accessed December 1, 2014).

Perez, Sarah. 2014. "iTunes App Store now has 1.2 million apps, has seen 75 billion downloads to date". *Techcrunch*, June 2. http://techcrunch.com/2014/06/02/itunes-app-store-now-has-1-2-million-apps-has-seen-75-billion-downloads-to-date/.

Research2guidance. 2013. ""Whitepaper: The Smartphone App Market 2013". http://www.research2guidance.com/shop/index.php/downloadable/download/sample/sample_id/267/ (accessed November 3, 2014).

Richter, Felix. 2013. "The Average Smartphone User Has Installed 26 Apps". *Statista*, September 5. http://www.statista.com/chart/1435/top-10-countries-by-app-usage/.

Scomavacca, E., S.J. Barnes, and S.L. Huff. 2006. "Mobile Business Research Published in 2000-2004: Emergence, Current Status, and Future Opportunities." *Communications of AIS*, 17: 635-646.

Sherman, Joshua. 2014. "The average Android phone is now half the price of an iPhone". *Digital Trends*, February 18. http://www.digitaltrends.com/mobile/android-way-cheaper-than-ios/.

Simonyi, E., Z. Fazekas, P. Gáspár. 2014. "Smartphone Applications for Assessing Various Aspects of Urban Public Transport." *Transportation Research Procedia*, 3: 185-194.

Snapchat Privacy Policy. 2014. Snapchat. https://www.snapchat.com/privacy/ (accessed December 3, 2014).

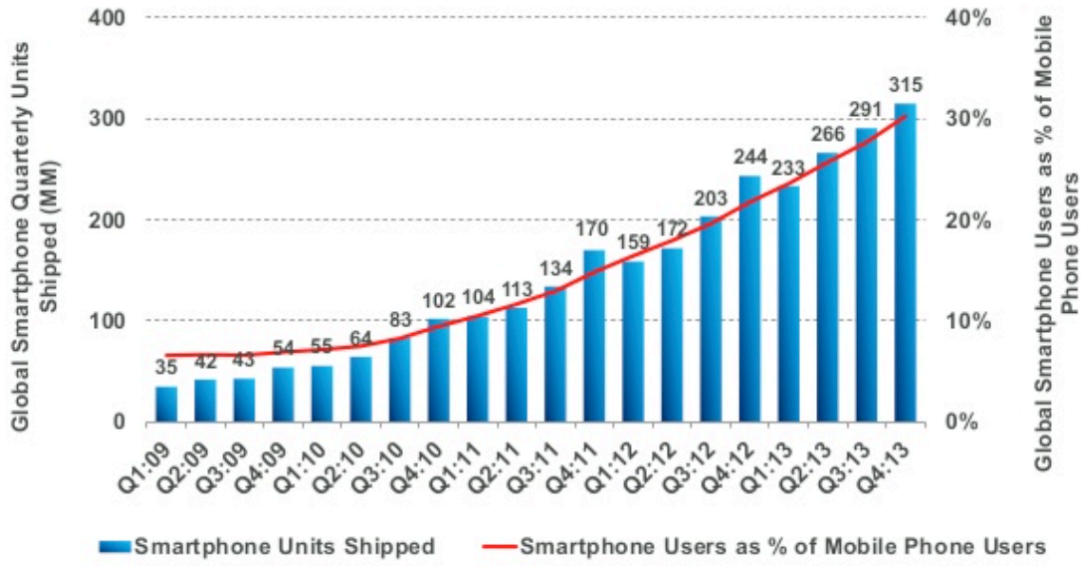
Statista. 2014. "Mobile Internet & Apps". http://www.statista.com/markets/424/topic/538/mobile-internet-apps (accessed November 3, 2014).

Uber Partners. 2014. Uber. https://partners.uber.com/drive/ (accessed December 27, 2014).

Whitney, Lance. 2014. "Windows Phone store hits more than 300,000 apps". CNET, August 8. http://www.cnet.com/news/windows-phone-store-hits-more-than-300000-apps/.

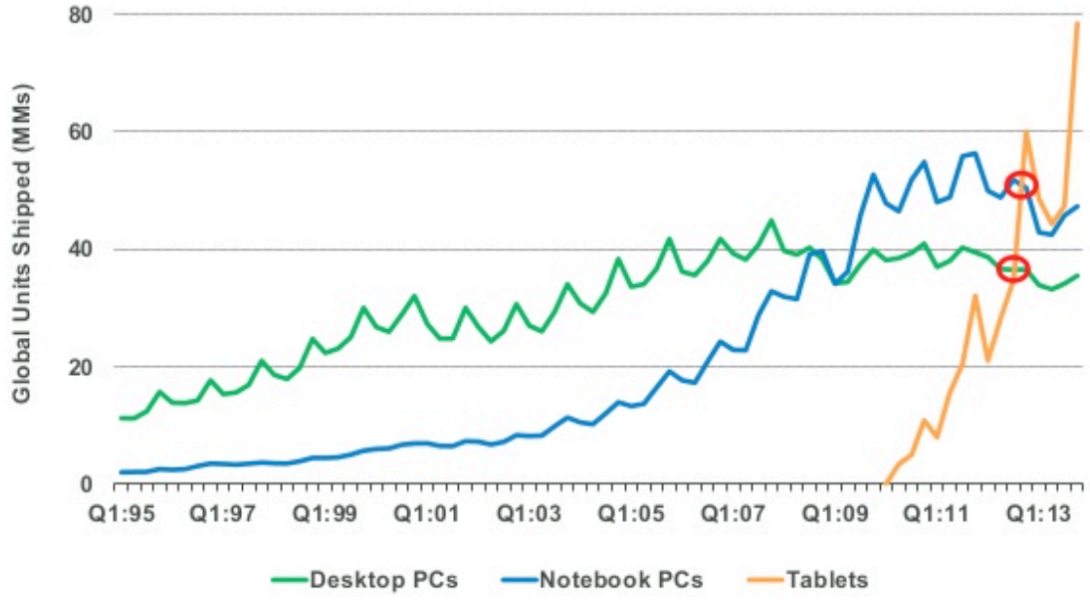
8. **Appendix**

<u>Appendix 1</u>: Global smartphone sales and percentage of smartphone users, 2009 – 2013



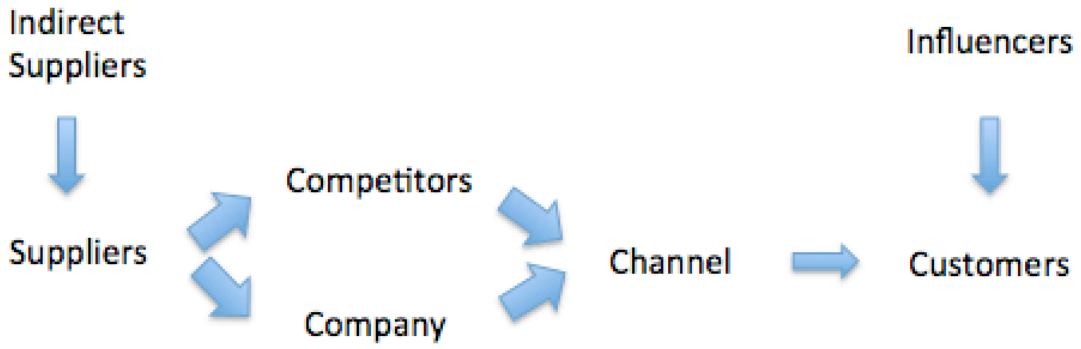
Source: KPCB Internet Trends, 2014

<u>Appendix 2</u>: Global tablet and PC sales, 2009 - 2013



Source: KPCB Internet Trends, 2014

Appendix 3: Value chain in the smartphone app industry



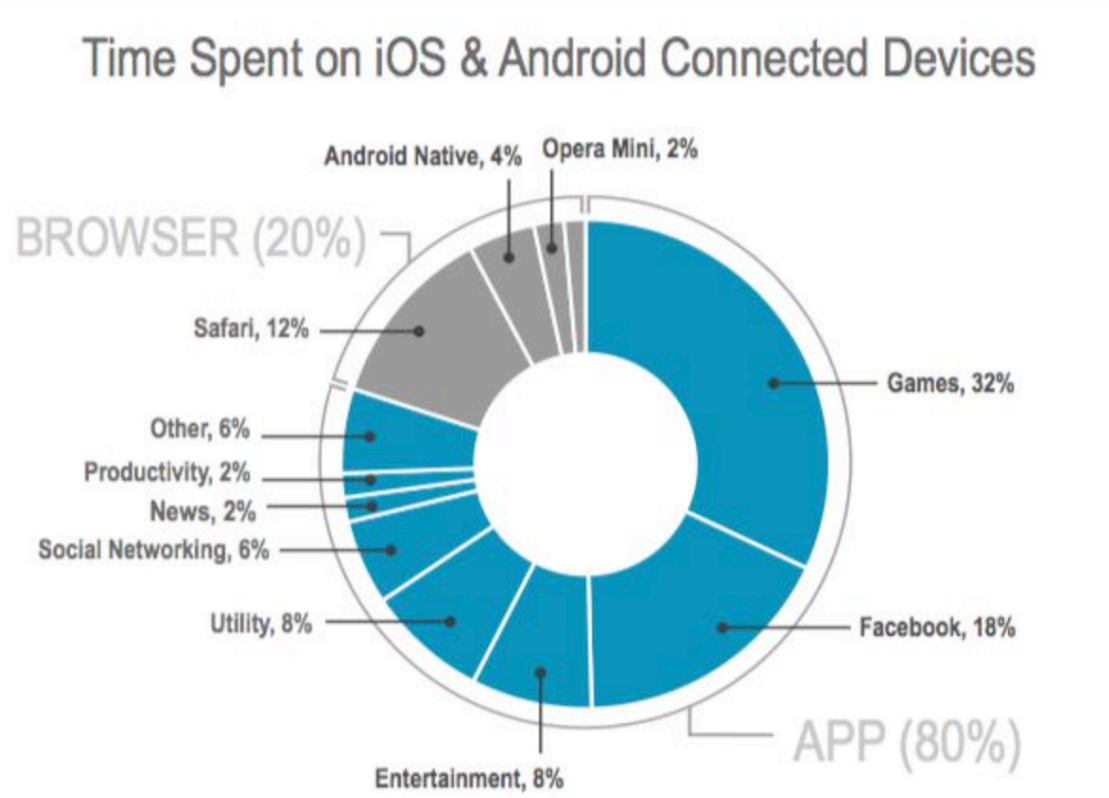
Appendix 4: Median app half-life

Median App Half Life (in months)

Category	
News	7
Health, Fitness, Medical	6
Business and Communication	6
Tools	5.5
Travel	4
Lifestyle	4
Media	4
Shopping	4
Social	3
Games	2
Peak MAU	
10,000+	5
Under 10,000	3
OS	
iOS	4
Android	3

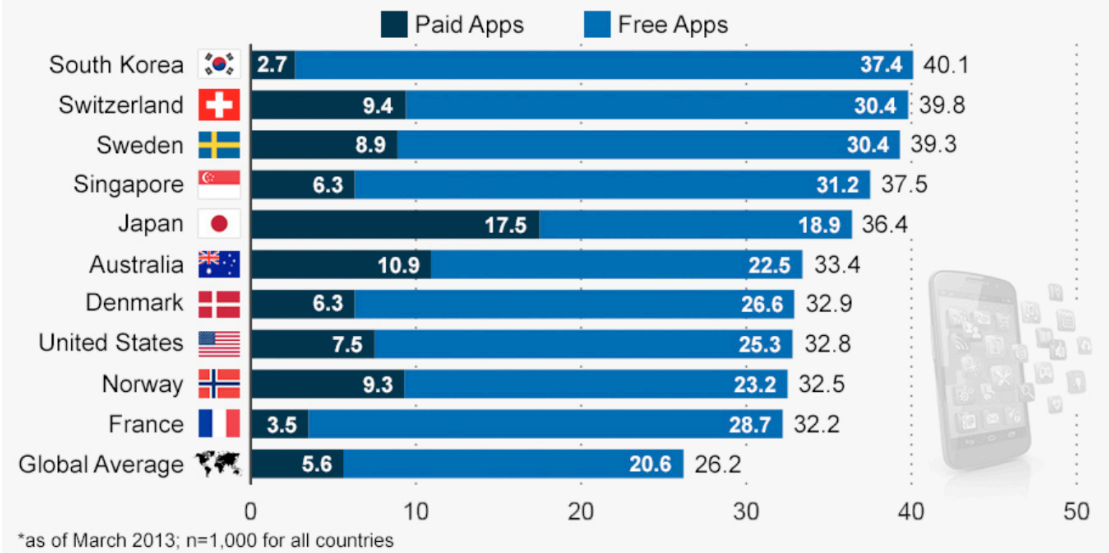
Source: Flurry Analytics

Appendix 5: Time spent on smartphone per app category



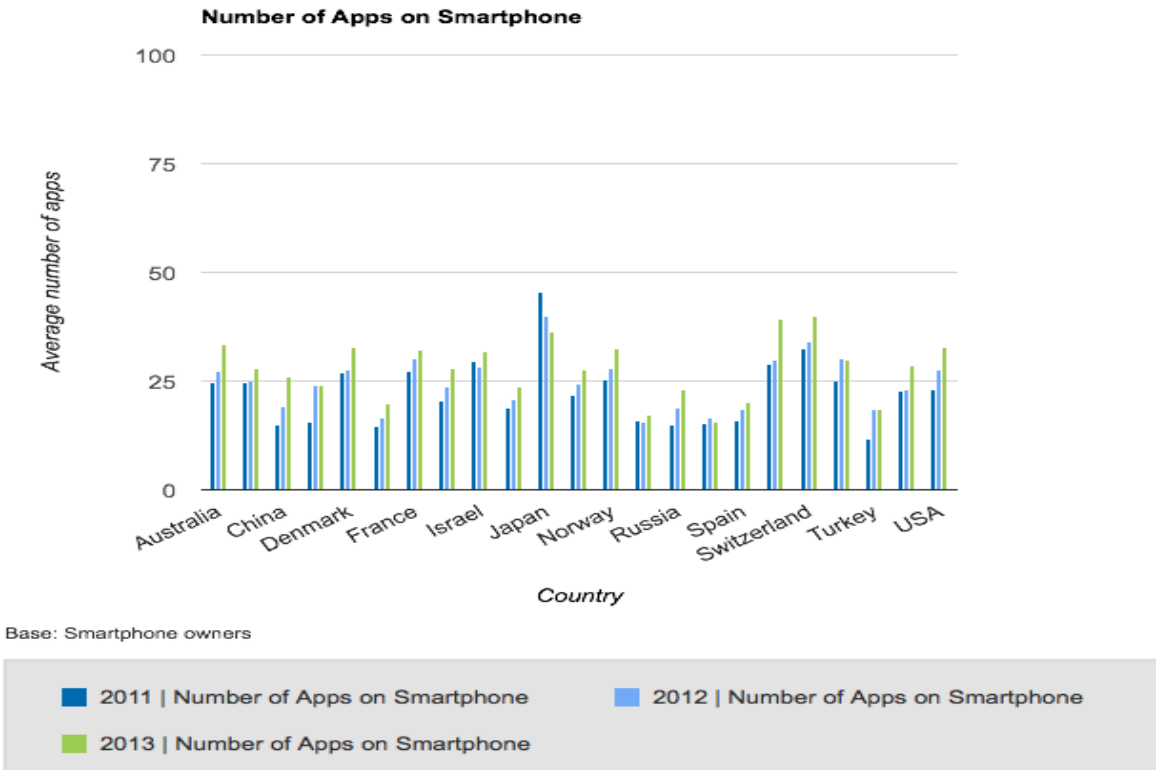
Source: Flurry Analytics

Appendix 6: Number of apps in user's smartphone



Source: Google – Our Mobile Planet, 2013

Appendix 7: Trend for number of apps per smartphone



Source: Google